UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

71407 7590 05/24/2010

ROBERT A. KENT
P.O. BOX 1431
DUNCAN, OK 73536

EXAMINER	
HENSON, MISCHITA L	
ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 05/24/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,698	03/30/2004	David P. Craig	2003-IP-011572	5836

TITLE OF INVENTION: METHOD AND AN APPARATUS FOR DETECTING FRACTURE WITH SIGNIFICANT RESIDUAL WIDTH FROM PREVIOUS TREATMENTS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	08/24/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

71407 7590 05/24/2010

ROBERT A. KENT
P.O. BOX 1431
DUNCAN, OK 73536

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,698	03/30/2004	David P. Craig	2003-IP-011572	5836

TITLE OF INVENTION: METHOD AND AN APPARATUS FOR DETECTING FRACTURE WITH SIGNIFICANT RESIDUAL WIDTH FROM PREVIOUS TREATMENTS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	08/24/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
HENSON, MISCHITA L	2857	702-011000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,698	03/30/2004	David P. Craig	2003-IP-011572	5836

71407 7590 05/24/2010

ROBERT A. KENT
P.O. BOX 1431
DUNCAN, OK 73536

EXAMINER	
HENSON, MISCHITA L	
ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 05/24/2010

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 1430 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 1430 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability	Application No.	Applicant(s)	
	10/813,698	CRAIG, DAVID P.	
	Examiner	Art Unit	
	Mi'schita' Henson	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment filed May 4, 2010*.

2. ☒ The allowed claim(s) is/are *1,2,5-17 and 20-30*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Hal D Wachsman/
Primary Examiner, Art Unit 2857

DETAILED ACTION

This action is responsive to the amendment filed May 4, 2010. Claims 1, 5-8, 10, 15,20,25 and 28-29 have been amended. Claims 3-4 and 18-19 have been cancelled. Claims 1-2, 5-17 and 20-30 are pending.

Response to Arguments

1. Applicant's arguments, see remarks pages 10-11, filed May 4, 2010, with respect to the rejection of claims 1-3, 7-18 and 22-30 and the objections to claims 4-6 and 19-21 have been fully considered and are persuasive. The rejections and objections of the claims have been withdrawn.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Melody Wirz (53,783) on Tuesday, May 11, 2010 at 11:45 a.m. EST.

The application has been amended as follows:

IN THE CLAIMS:

Claim 21 line 1 recited "The system of claim 19 further comprising", has been amended to recite --The system of claim 15 further comprising--.

Allowable Subject Matter

3. Claims 1-2, 5-17 and 20-30 are allowed (renumbered 1-26, respectively).

4. The following is an examiner's statement of reasons for allowance:

Claim 1 is indicated allowed because the closest prior art, Patzek et al. in US Patent 6,904,366 and Engler et al. in NPL "Analysis of pressure and pressure derivative without type curve matching, 4. Naturally fractured reservoirs", fails to anticipate or render obvious A method of detecting a fracture with residual width from a previous well treatment during a well fracturing operation in a subterranean formation containing a reservoir fluid, comprising the steps of:

(a) injecting an injection fluid into the formation at an injection pressure exceeding the formation fracture pressure;

(b) gathering pressure measurement data from the formation during the injection and a subsequent shut-in period;

(c) transforming the pressure measurement data into a constant rate equivalent pressure; and

(d) detecting the presence of a dual unit-slope wellbore storage in the transformed pressure measurement data, said dual unit-slope being indicative of the presence of a fracture retaining residual width;

wherein the reservoir fluid is compressible;

the transformation of pressure measurement data is based on the properties of the compressible fluid contained in the reservoir; and

the transforming step comprises the step of calculating:

- a shut-in time relative to the end of the injection: $\Delta t = t - t_{ne}$;
- an adjusted time: $t_a = (\overline{\mu c_t}) \int_0^{\Delta t} \frac{d\Delta t}{(\mu c_t)_w}$; and

- an adjusted pseudo pressure difference: $\Delta p_a(t) = p_{aw}(t) - p_{at}$

where $p_a = \frac{\bar{\mu}_g \bar{z}}{\bar{p}} \int_0^p \frac{p dp}{\mu_g z}$;

- wherein:

- t_{ne} is the time at the end of injection;

$\bar{\mu}$ is the viscosity of the reservoir fluid at average reservoir pressure;

$(\mu c_1)_w$ is the viscosity compressibility product of wellbore fluid at

$(\mu c_1)_0$ is the viscosity compressibility product of wellbore fluid at time $t = t_{ne}$;

p is the pressure;

$\bar{p}$ is the average reservoir pressure;

$p_{aw}(t)$ is the adjusted pressure at time t;

p_{at} is the adjusted pressure at time $t = t_{ne}$;

c_t is the total compressibility;

$\bar{c}_t$ is the total compressibility at average reservoir pressure; and

z is the real gas deviator factor, **in combination** with all other limitations as presented by Applicant.

Claim 15 is indicated allowed because the closest prior art, Patzek et al. in US Patent 6,904,366 and Engler et al. in NPL "Analysis of pressure and pressure derivative without type curve matching, 4. Naturally fractured reservoirs", fails to anticipate or

render obvious A system for detecting a fracture with residual width from a previous well treatment during a well fracturing operation in a subterranean formation containing a reservoir fluid, comprising:

- a pump for injecting an injection fluid at an injection pressure exceeding the formation fracture pressure;

- means for gathering pressure measurement data in the wellbore at various points in time during the injection and a subsequent shut-in period;

- processing means for transforming said pressure measurement data into a constant rate equivalent pressure; and

- means for detecting the presence of a dual unit-slope wellbore storage in the transformed pressure measurement data, said dual unit-slope being indicative of the presence of a fracture retaining residual width;

wherein the reservoir fluid is compressible;

the transformation of pressure measurement data is based on the properties of the compressible fluid contained in the reservoir; and

the transforming step comprises the step of calculating:

- a shut-in time relative to the end of the injection: $\Delta t = t - t_{ne}$;

- an adjusted time: $t_a = (\overline{\mu c_t}) \int_0^{\Delta t} \frac{d\Delta t}{(\mu c_t)_w}$; and

- an adjusted pseudo pressure difference: $\Delta p_a(t) = p_{aw}(t) - p_{ai}$

where $p_a = \frac{\overline{\mu_g} \overline{z}}{\overline{p}} \int_0^p \frac{p dp}{\mu_g z}$;

- wherein:
- t_{ne} is the time at the end of injection;

  $\bar{\mu}$ is the viscosity of the reservoir fluid at average reservoir pressure;

  $(\mu c_1)_w$ is the viscosity compressibility product of wellbore fluid at

  $(\mu c_1)_0$ is the viscosity compressibility product of wellbore fluid at time $t = t_{ne}$;

  p is the pressure;

  $\bar{p}$ is the average reservoir pressure;

  $p_{aw}(t)$ is the adjusted pressure at time t;

  p_{at} is the adjusted pressure at time $t = t_{ne}$;

  c_t is the total compressibility;

  $\bar{c}_t$ is the total compressibility at average reservoir pressure; and

  z is the real gas deviator factor, **in combination** with all other limitations as presented by Applicant.

Claim 28 is indicated allowed because the closest prior art, Patzek et al. in US Patent 6,904,366 and Engler et al. in NPL "Analysis of pressure and pressure derivative without type curve matching, 4. Naturally fractured reservoirs", fails to anticipate or render obvious A system for detecting a fracture with residual width from previous well treatment during a well fracturing operation in a subterranean formation containing a reservoir fluid, comprising:

- a pump for injecting an injection fluid at an injection pressure exceeding the formation fracture pressure;

- means for gathering pressure measurement data in the wellbore at various points in time during the injection and a subsequent shut-in period;

- processing means for transforming said pressure measurement data into a constant rate equivalent pressure; and

- graphics means for plotting said transformed pressure measurement data representative of before and after closure periods of wellbore storage, and for detecting a dual unit-slope wellbore storage indicative of the presence of a fracture retaining residual width;

wherein

the reservoir fluid is compressible;

the transformation of pressure measurement data is based on the properties of the compressible fluid contained in the reservoir; and

the transforming step comprises the step of calculating:

- a shut-in time relative to the end of the injection: $\Delta t = t - t_{ne}$;
- an adjusted time: $t_a = (\overline{\mu c_t}) \int_0^{\Delta t} \frac{d\Delta t}{(\mu c_t)_w}$; and
- an adjusted pseudo pressure difference: $\Delta p_a(t) = p_{aw}(t) - p_{ai}$

where $p_a = \frac{\overline{\mu_g z}}{\overline{p}} \int_0^p \frac{p dp}{\mu_g z}$;

- wherein:

- t_{ne} is the time at the end of injection;

  $\bar{\mu}$ is the viscosity of the reservoir fluid at average reservoir pressure;

  $(\mu c_1)_w$ is the viscosity compressibility product of wellbore fluid at

  $(\mu c_1)_0$ is the viscosity compressibility product of wellbore fluid at time $t = t_{ne}$;

  p is the pressure;

  $\bar{p}$ is the average reservoir pressure;

  $p_{aw}(t)$ is the adjusted pressure at time t;

  p_{at} is the adjusted pressure at time $t = t_{ne}$;

  c_t is the total compressibility;

  $\bar{c}_t$ is the total compressibility at average reservoir pressure; and

z is the real gas deviator factor, **in combination** with all other limitations as presented by Applicant.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mi'schita' Henson whose telephone number is (571)

270-3944. The examiner can normally be reached on Monday - Thursday 7:30 a.m. - 4:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

05/11/2010
/Mi'schita' Henson/

Examiner, Art Unit 2857

/Hal D Wachsman/
Primary Examiner, Art Unit 2857